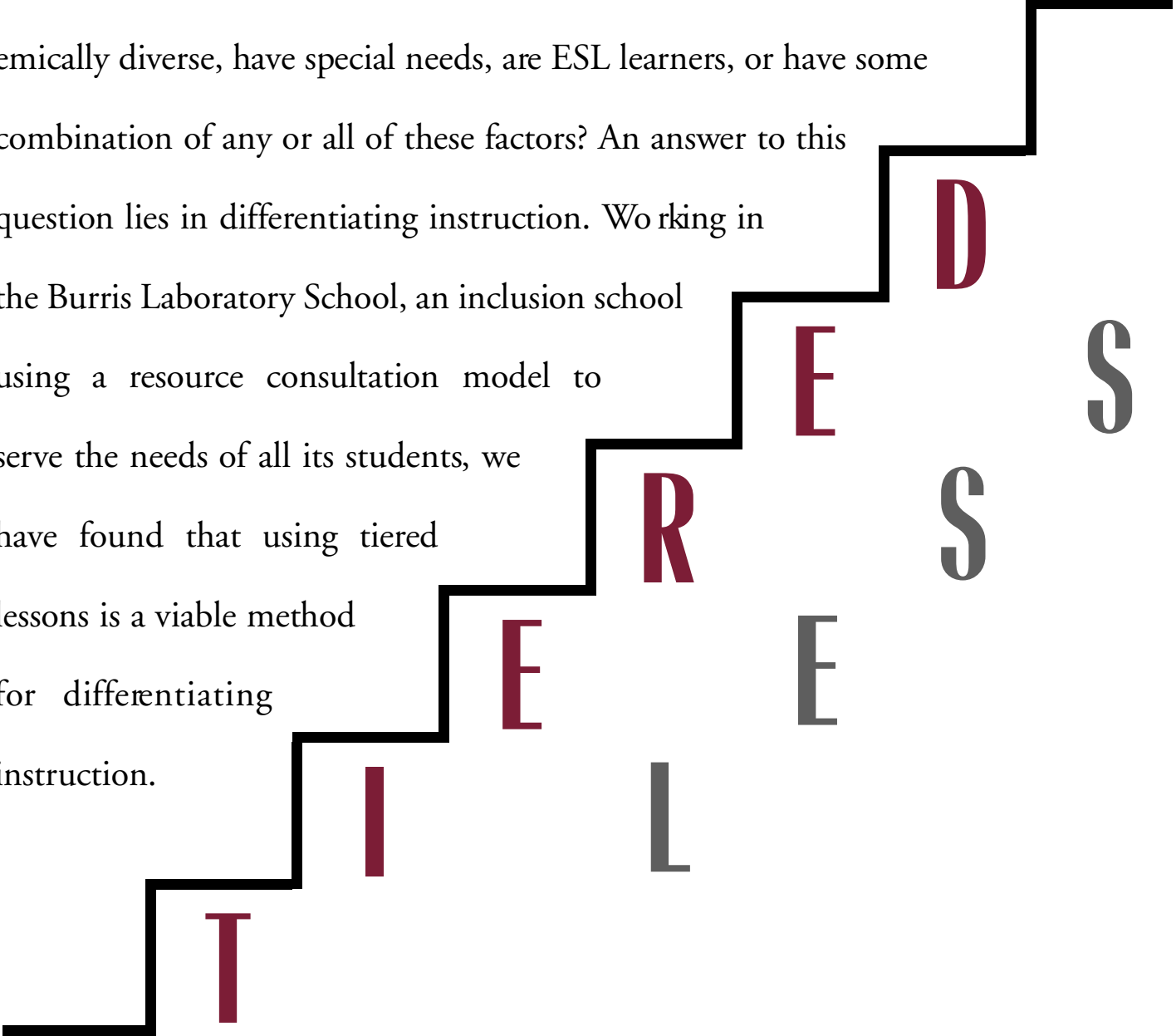
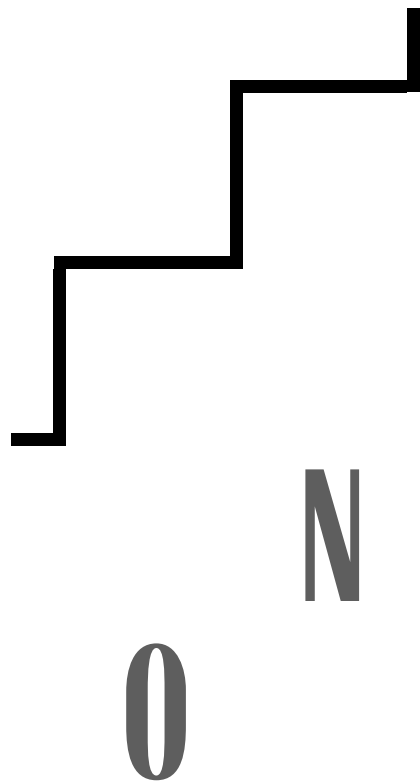


**T**he movement toward inclusion has impacted classrooms by requiring teachers to respond to a broader range of academic needs. How can we possibly reach all the students in our classrooms when they are academically diverse, have special needs, are ESL learners, or have some combination of any or all of these factors? An answer to this question lies in differentiating instruction. Working in the Burris Laboratory School, an inclusion school using a resource consultation model to serve the needs of all its students, we have found that using tiered lessons is a viable method for differentiating instruction.

A graphic of a staircase with a thick black line forming the steps. The letters T, I, E, R, E, D, S, S, L, E, S are arranged in a descending staircase pattern from left to right. The letters T, I, E, R, and E are maroon, while D, S, S, L, and E are grey.

by **Rebecca L. Pierce and Cheryll M. Adams**



O n e

W a y

t o D i f f e r e n t i a t e

M a t h e m a t i c s

I n s t r u c t i o n

## What is Differentiation?

Although differentiated instruction is not a new idea, the differentiation movement has recently taken center stage as a means of meeting the needs of all students in the classroom. It is an organized, yet flexible way of proactively adjusting teaching and learning to meet students where they are and help all students achieve maximum growth as learners (Tomlinson, 1999). Instruction may be differentiated in content/input, process/sense-making, or product/output according to the students' readiness, interest, or learning style. By *content*, we mean the material that is being presented. *Process* activities help students practice or make sense out of the content, while *product* refers to the outcome of the lesson or unit, such as a test, project, or paper. *Readiness* refers to prior knowledge and a student's current skill and proficiency with the material presented in the lesson. A student's interest may be assessed with an interest inventory for the particular topic being stud-

ied or by an individual conversation with the student. Many teachers use the theory of multiple intelligences to characterize learning styles (Armstrong, 1994; Gardner, 1993; Martin, 1996).

Essential elements for successful differentiation include specific classroom management techniques addressing the special needs of a differentiated classroom, planned use of anchoring activities, and flexible use of time, space, and student groups. In a differentiated classroom, the management plan must include rules for working in a variety of configurations. You can only work with one group or individual at a time. Therefore, we have developed two critical rules that thwart chaos and preserve sanity. The first is "Use six-inch voices," meaning that students should modulate their speaking level so that their voices can only be heard six inches away. The second rule is "Ask three before me." If students need assistance completing a task or come to a stumbling block in a lesson and you are not available, they should find three other students to ask

before they may interrupt you. If their three peers cannot answer the question, the student has permission to interrupt you. Adding the caveat that the student should also bring along the three students who were asked will nearly eliminate the chance that you will be interrupted except in extreme cases. Anchoring or "sponge" activities are provided for students to use when they are waiting for you to assist them before they can go any further or at the beginning of the class period to get them ready to work. A wide variety of materials and resources can serve as anchoring activities (see our Web site at <http://www.bsu.edu/teachers/services/ctr/javits/Instruction/anchoring.htm> for a listing of books that have great activities for anchoring). Flexible grouping arrangements such as pairs, triads, or quads, as well as whole-group and small-group instruction, create opportunities to meet individual needs. A flexible use of time allows lessons to proceed to their natural conclusion, rather than being carried out in set blocks of time. The desks or tables

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First-grade teacher Martha Kendrick reads from *Eating Fractions* to Tier II students

should be arranged in such a way as to facilitate group work, as well as whole-class groupings that encourage sharing of ideas.

A variety of instructional strategies, including compacting, learning contracts, cubing, and tiered lessons, can be used to differentiate instruction (for a discussion of these and other strategies, see Gregory & Chapman, 2002; Heacox, 2002; Smutney, Walker, & Meckstroth, 1997; Tomlinson, 1999; Winebrenner, 1992). It makes sense to alert your administration and the parents that you will be trying some new strategies in the classroom in case there are questions.

The tenets of differentiated instruction support both the Equity Principle and the Teaching Principle of the Principles and Standards for School Mathematics (National Council of Teachers of Mathematics, 2000). These principles direct us to select and adapt

content and curricula to meet the interests, abilities, and learning styles of our students; to recognize our students' diversity; and to encourage them to reach their full potential in mathematics.

### What is a Tiered Lesson?

Tomlinson (1999) described tiered lessons as "the meat and potatoes of differentiated instruction." A tiered lesson is a differentiation strategy that addresses a particular standard, key concept, and generalization, but allows several pathways for students to arrive at an understanding of these components based on their interests, readiness, or learning profiles. A lesson tiered by readiness level implies that the teacher has a good understanding of the students' ability levels with respect to the lesson and has designed the tiers to meet those needs.

Think of a wedding cake with tiers of varying sizes. Many examples of lessons tiered in readiness have three tiers: below grade level, at grade level, and above grade level. There is no rule that states there may only be three tiers, however. The number of tiers we use will depend on the range of ability levels in your own classroom since you are forming tiers based on your assessment of your students' abilities to handle the material particular to *this* lesson. Students are regrouped the next time you use tiering as a strategy. Hence, the idea of flexible, rather than static, groups is essential.

No matter how you choose to differentiate the lesson—readiness, interest, or learning profile—the number of groups per tier will vary, as will the number of students per tier. You are not looking to form groups of equal size. When you form groups based on the readiness needs of individual students, Tier I may have two groups of three students, Tier II five groups of four students, and Tier III may have one group of two students. When the lesson is tiered by interest or learning profile, the same guidelines apply for forming groups: Different tiers may have varying numbers of students. Even when students are already homogeneously grouped in classes by ability, there is still variance in their ability levels that must be addressed.

To take a closer look at the anatomy of a tiered lesson, we have included a

<b>Subject:</b>	Mathematics
<b>Grade:</b>	First
<b>Standard:</b>	Numbers and Operations
<b>Key Concept:</b>	Students understand and represent commonly used fractions such as $\frac{1}{4}$ and $\frac{1}{2}$ .
<b>Generalization:</b>	Students will be able to illustrate how fractions represent part of a whole.
<b>Background:</b>	Fractions (halves/thirds) have been introduced and illustrated by the students with pictures. Materials: Paper circles, squares, rectangles, triangles
<b>Tier I:</b>	Using paper circles (pizza) and squares (sandwich), students in pairs determine how to share the food equally and illustrate by folding the paper. Have two pairs determine how they can share equally with four people. They can cut the parts and stack them to see if they match. Have the quad repeat the process for sharing a Reese's Peanut Butter Cup equally with three people.
<b>Tier II:</b>	Using paper circles (pizza) and squares (sandwich), have students in triads determine how to share the food equally and illustrate by folding the paper. Have two triads determine how they can share equally with six people. Have the group of six repeat the process for sharing a birthday cake with 12 people. In each case, they can cut the parts and stack to match. Have the group start with half a cake and divide equally for 3, 6, and 12 people.
<b>Tier III:</b>	Using paper rectangles (sandwiches) and triangles (slices of pie), have students in pairs determine how to share the food in three different ways to get two equal parts. Have them illustrate by folding the paper. Are there other different ways to divide each shape equally? How many ways are there? Have the pair determine which shapes—circles, squares, rectangles, triangles—are easier to divide evenly and illustrate why with a particular food of their choice.
<b>Assessment:</b>	As the students work, the teacher will circulate among the groups and note the children's abilities to divide materials into equal parts and to recognize and check for equal parts. Can children explain orally how many equal parts there are and demonstrate how they know the parts are equal? It is at the teacher's discretion to determine which children need more in-depth questioning to ascertain mastery of the concept.

**Figure 1**  
**Tiered Lesson in Mathematics: Tiered in Content According to Readiness**

mathematics lesson (see Figure 1) that was developed as part of the Javits Grant, Project GATE, a federally funded partnership between the Indianapolis Public Schools and Ball State University, both in Indiana. When developing a tiered lesson, we have found the eight steps described below useful.

1. *First, identify the grade level and subject for which you will write the lesson.* In this case, the grade level is first and the subject is mathematics.
2. *Second, identify the standard (national, state, district, etc.) you are targeting.* A common mistake for those just

beginning to tier is to develop three great activities and then try to force-fit them into a tiered lesson. Start with the standard first. If you don't know where you are going, how will you know if you get there? The author of this lesson has selected the Content Standard "Number and Operations" of the National





**Tier III students work on folding their fraction pieces in thirds.**

Council of Teachers of Mathematics' (2000) *Principles and Standards for School Mathematics* (pp. 78–88).

3. *Third, identify the key concept and generalization.* The key concept follows from the standard. Ask yourself, "What big idea am I targeting?" In this example, it is to understand and represent commonly used fractions. While there are many concepts that could be covered under the standard chosen, this lesson addresses only one. The generalization follows from the concept chosen. Ask, "What do I want the students to know at the end of the lesson, regardless of their placement in the tiers?" In this lesson, all students will develop their

understanding of fractions as representing parts of a whole.

4. *Fourth, be sure students have the background necessary to be successful in the lesson.* What scaffolding is necessary? What must you have already covered or what must the student have already learned? Are there other skills that must be taught first? Before engaging in this lesson, students have been exposed to halves and thirds. Fractions (halves/ thirds) have been introduced to the students, and they have illustrated them with pictures. There are several literature books that illustrate fractional parts using food that could be used to introduce the lesson.

5. *Fifth, determine in which part of the lesson (content, process, product) you will tier.* You may choose to tier the content (what you want the students to learn), the process (the way students make sense out of the content), or the product (the outcome at the end of a lesson, lesson set, or unit—often a project). When beginning to tier, we suggest that you only tier one of these three. Once you are comfortable with tiering, you might try to tier more than one part in the same lesson. This lesson is tiered in content.

6. *Sixth, determine the type of tiering you will do:*

*readiness, interest, or learning profile.* Readiness is based on the ability levels of the students. Giving a pretest is a good way to assess readiness. Students' interest in a topic is generally gauged through an interest survey, while the learning profile may be determined through various learning style inventories. In this lesson, the author chose readiness.

7. *Seventh, based on your choices above, determine how many tiers you will need and develop the lesson.* When tiering according to readiness, you may have three tiers: below grade level, at grade level, and above grade level. If you choose to tier in interest or learning profile

file, you may control the number of tiers by limiting choices or using only a few different learning styles. For example, tiering on all eight of Gardner's multiple intelligences in one lesson may not be a good place to start, so choose only a few, such as logical-mathematical intelligence, spatial intelligence, and linguistic intelligence. (For further information on multiple intelligences in an easy-to-understand format, see Wahl, 1997). For this lesson, students are placed in one of three tiers based on their ability to work with halves and thirds as assessed by the teacher through observation.

Differentiation means doing something different—qualitatively different. Make sure you keep this in mind when tiering the lessons. Second, be sure that students are doing challenging, respectful, and developmentally appropriate work within each tier. In other words, no group should be given “busywork.” We don't want one group doing black-line practice sheets and another doing a fabulous experiment.

Notice in this lesson that all three tiers are working on fractions. Students in each tier use paper shapes to divide. However, the activities for each tier in the sample lesson, beginning in Tier I and moving through Tier III, differ from concrete to abstract and from simple to complex, to use Tomlinson's Equalizer word pairs (Tomlinson, 1999).

8. *Finally, develop the assessment component to the lesson.* The assessment can be formative, summative, or a combination of both. You may use some means of recording observations of the various groups, such as flip cards or sticky notes. You could develop a rubric for each tier based on the particular product that is created. You may give a formal paper-and-pencil test. Whatever it is, choose your assessment based on your needs and your lesson design.

In this lesson, the teacher observes the students as they share their answers



**Tier II students determine ways to share their “cake” with 12 people and their “sandwich” with 6 people.**

and jots down notes for a formative assessment of each student. For example, which child is struggling with the concept? Which child is moving rapidly and accurately through the material? Whose answers show more thought and insight? Answers to these and other questions will assist you in determining who needs reteaching and who is ready to go beyond the material presented. A formal assessment is not used here since the standards emphasize that students should have “informal experiences [with fractions] at this age to help develop a foundation for deeper learning in the higher grades” (NCTM, 2000, p. 83).

When this lesson was taught, the students were engaged during the entire lesson. The lesson was introduced by

reading the book *Eating Fractions* (McMillan, 1991). Students were placed in groups based on their level of readiness to interact with the content. Four students did not have a clear understanding of halves and fourths. These students needed a more concrete activity and were placed in Tier I. Another 12 students could recognize halves and thirds and were ready to complete the Tier II activity. They were placed in four triads. Two students had in-depth knowledge of halves and thirds and were placed in Tier III. This pair worked at a more abstract level, and the questions they were asked required them to use different critical thinking skills than the other two groups. Tier I and Tier II students were provided with activities from the book *Fractions* (Watt, 2001) to use as



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Tier II students determine how to share a “pizza” and a “sandwich” equally with three people.

anchoring activities if they finished early or were waiting for the teacher’s assistance. The anchor for Tier III students was *Apple Fractions* (Pallotta, 2002), which introduced fifths through tenths.

The second sample lesson (see Figure 2) is tiered in process according to learning style. In this case, students are grouped heterogeneously based on one of two learning preferences: kinesthetic or visual. The same eight steps for tiering a lesson apply in this case. In the second lesson, notice that the activities are at relatively the same level of complexity. This would be the “layer cake” model as opposed to the “wedding cake” model used when tiering according to readiness.

### Final Thoughts

Time, energy, and patience are

required to learn to differentiate instruction effectively in an academically diverse classroom. In addition, you need administrative and peer support, as well as professional development over extended periods of time; therefore, don’t expect to have a differentiated classroom by Monday morning. Start small: Choose a favorite lesson in your next unit and differentiate it according to the needs of your students. Seek the expertise of specialists such as special and gifted education coordinators, media specialists, and others with whom you can collaborate to improve instruction in the academically diverse classroom.

For more information on tiering, contact the Center for Gifted Studies and Talent Development, Ball State University (BSU) at (800) 842-4251. Two Web sites that provide good examples of tiered lessons are the Center for

Gifted Studies and Talent Development at BSU as part of the Javits Grant, Project GATE, and the Indiana Department of Education Gifted and Talented Unit’s Tiered Lesson Project, developed by Cheryl Adams, Felicia Dixon, and Rebecca Pierre and funded by the Indiana Department of Education (IDOE). For the BSU site, go to <http://www.bsu.edu/teachers/services/ctr/javits> and click on the Instruction picket on the white gate. For the IDOE site, go to [http://doe.state.in.us/exceptional/gt/tiered\\_curriculum/welcome.html](http://doe.state.in.us/exceptional/gt/tiered_curriculum/welcome.html). **GCT**

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<b>Subject:</b>	Mathematics
<b>Grade:</b>	Third
<b>Standard:</b>	#5 Geometry and #6 Spatial Sense
<b>Key Concept:</b>	Students work with geometric shapes and develop spatial sense.
<b>Generalization:</b>	Students identify lines of symmetry of objects.
<b>Background:</b>	This would be the fourth or fifth lesson in a unit on geometry where the first few lessons have covered various geometric shapes, as well as slides, flips, turns, congruence, and symmetry.
<b>Tier I:</b>	<p><i>Kinesthetic Learners</i></p> <p>Pairs of students use brightly colored paper to make several simple origami designs. Provide guidance when necessary. When students are finished, have them unfold the figure(s), find any congruent figures, and identify lines of symmetry. Students then share the origami figures and have classmates try to construct them.</p>
<b>Tier II:</b>	<p><i>Visual Learners</i></p> <p>Pairs of students work with pictures of items from nature, such as a butterfly, sunflower, rainbow, snowflake, or starfish. Students find any congruent figures and identify lines of symmetry for each item. Students color the pictures to help show the lines of symmetry. Students cut out the figures and have classmates find the lines of symmetry.</p>
<b>Assessment:</b>	Use a summative assessment noting students' abilities to identify the congruent figures and lines of symmetry. Have each student reflect in writing about congruent figures and lines of symmetry. From a list of objects in the classroom, students will select an object and write about whether or not the object has congruent parts, lines of symmetry, or both and then explain why. The students could also include a drawing that illustrates the congruent parts, lines of symmetry, or both.

**Figure 2**  
**Tiered Lesson in Mathematics:**  
**Tiered in Process According to Learning Style**

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